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EXAMINER	
WEST, JEFFREY R	
ART UNIT	**PAPER NUMBER**
2857	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/660,697	CHAMNESS, KEVIN ANDREW	
	Examiner	Art Unit	
	Jeffrey R. West	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) *43-46,49 and 50* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-42,47 and 48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 November 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

On page 23, paragraph 0110, line 1, "FIG. 13" should be ---FIG. 12---.

On page 24, paragraph 00100, line 1, "FIG. 12" should be ---FIG. 13---.

Appropriate correction is required.

Claim Objections

2. Claims 1, 19, 25, 33, 41, 42, and 48 are objected to because of the following informalities:

In claim 1, line 20, to avoid problems of antecedent basis, "the course of manufacturing" should be ---the course of semiconductor manufacturing---.

In claim 19, line 15, to avoid confusion, "provide based on the statistical quantity an" should be ---provide, based on the statistical quantity, an---.

In claim 19, lines 16-17, to avoid problems of antecedent basis, "the course of manufacturing" should be ---the course of semiconductor manufacturing---.

In claim 25, lines 25-26, to avoid problems of antecedent basis, "the course of manufacturing" should be ---the course of semiconductor manufacturing---.

In claim 33, lines 24-25, to avoid problems of antecedent basis, "the course of manufacturing" should be ---the course of semiconductor manufacturing---.

In claim 41, line 16, to avoid problems of antecedent basis, "said PCA model" should be ---said initial PCA model---.

In claim 41, line 22, to avoid problems of antecedent basis, "the course of manufacturing" should be ---the course of semiconductor manufacturing---.

In claim 42, lines 2, 4, and 6, to avoid problems of antecedent basis, the/said "PCA model" should be the/said---initial PCA model---.

In claim 48, line 14, "model i" should be ---model---.

In claim 48, line 16, to avoid problems of antecedent basis, "said PCA model" should be ---said initial PCA model---.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1-42, 47, and 48 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 is rejected as failing to comply with the written description requirement because, as currently amended, it contains a limitation for "applying said updated adaptive centering coefficients to each of said data parameters in said initial PCA model".

Turning to the specification on page 23, paragraphs 0110-0112 with reference to

Figure 12:

> FIG. [12] presents a flow chart describing a method of monitoring a processing system for processing a substrate during the course of semiconductor manufacturing. The method 500 begins at 510 with acquiring data from the processing system for a plurality of observations. The processing system can, for example, be an etch system, or it may be another processing system as described in FIG. 1. The data from the processing system can be acquired using a plurality of sensors coupled to the processing system and a controller. The data can, for example, comprise any measurable data parameter, and any statistic thereof (e.g., mean, standard deviation, skewness, kurtosis, etc.). Additional data can, for example, include optical emission spectra, RF harmonics of voltage and/or current measurements or radiated RF emission, etc. Each observation can pertain to a substrate run, instant in time, time average, etc.
>
> At 520, a PCA model is constructed from the acquired data parameters by determining one or more principal components to represent the data at 530 and applying static centering and scaling coefficients, as described above, to the data parameters of the acquired data at 540. For example, a commercially available software such as MATLAB™ and PLS Toolbox can be utilized to construct the PCA model.
>
> At 550, additional data is acquired from a processing system, and, at 555, adaptive centering and scaling coefficients are utilized when applying the PCA model to the acquired data parameters. At 560, at least one statistical quantity is determined from the additional data and the PCA model.

Based on this disclosure, the method constructs an initial PCA model based on the originally acquired data. Static centering and scaling coefficients are then applied to the initial PCA model. Additional data is then acquired and adaptive centering and scaling coefficients are applied to the new PCA model that has been updated with the additional data. This disclosure, therefore supports the application of adaptive centering and/or scaling coefficients to the new PCA model, but not the initial PCA model. For this reason, one having ordinary skill in the art would not recognize that Applicant had possession of the invention as claimed and

independent claim 1 is therefore rejected as failing to comply with the written description requirement.

Independent claims 19, 25, 33, 41, 47 and 48 are similarly rejected for including limitations for applying adaptive centering coefficients to the initial PCA model and dependent claims 8, 27, and 35 are similarly rejected for including limitations for applying adaptive scaling coefficients to the initial PCA model.

Claims 2-7, 9-18, 20-24, 26, 28-32, 34, 36-40, and 42 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement, because they incorporate the lack of support present in their respective parent claims.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 47 and 48 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 47 and 48 are considered to be vague and indefinite because they recite, "comparing said at least one statistical quantity to said control limit in order to determine if the substrate processing remains within control during the course of manufacturing." Claims 47 and 48, however, contain no previous mention of any "substrate processing" or "manufacturing" and therefore it is unclear to one having

ordinary skill in the art as to what processing and manufacturing "the substrate processing" and "the course of manufacturing" refer.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 1-24, 41, 42, 47, and 48 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-24, 41, and 42 are considered to be non-statutory. It has been held that the claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." State Street, 149 F.3d at 1373, 47 USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)). In determining whether the claim is for a "practical application," the focus is not on whether the steps taken to achieve a particular result are useful, tangible and concrete, but rather that the final result is "useful, tangible and concrete."

Furthermore, a process that consists solely of the manipulation of an abstract idea is not concrete or tangible. See In re Warmerdam, 33 F.3d 1354, 1360, 31

USPQ2d 1754, 1759 (Fed. Cir. 1994). See also Schrader, 22 F.3d at 295, 30 USPQ2d at 1459.

Independent claim 1, and dependent claims 2-18, provides a concluding step of "comparing said at least one statistical quantity to said control limit in order to determine if the substrate processing remains within control during the course of manufacturing." This final step of determining does not produce a "useful, concrete and tangible result" but is instead a result of internal data manipulation that is not externally conveyed, specifically the method does not output, store, or produce any tangible form of the determination to accomplish a practical application. Also, since the resulting determination is not used for any intended purpose, it appears to be only a starting point for future application. For these reasons, claims 1-18 are considered to be non-statutory.

Independent claim 41, and dependent claim 42, similarly provides a concluding step of "comparing said at least one statistical quantity to said control limit in order to determine if the substrate processing remains within control during the course of manufacturing." This final step of "determining" does not produce a "useful, concrete and tangible result" but is instead a result of internal data manipulation that is not externally conveyed, specifically the method does not output, store, or produce any tangible form of the determination to accomplish a practical application. Also, since the resulting determination is not used for any intended purpose, it appears to be only a starting point for future application. For these reasons, claims 41 and 42 are considered to be non-statutory.

Independent claim 19, and dependent claims 20-24, provides a concluding step of "said updated adaptive centering coefficient implemented in the initial PCA model to provide based on the statistical quantity an improved process center for the substrate processing in order to update the substrate processing during the course of manufacturing." This final step of updating the substrate processing does not produce a "useful, concrete and tangible result" but is instead a result of internal data manipulation that is not externally conveyed, specifically the method does not output, store, or produce any tangible form of the updated processing to accomplish a practical application. Also, since the resulting processing is not used for any intended purpose, it appears to be only a starting point for future application. For these reasons, claims 19-24 are considered to be non-statutory.

Claims 47 and 48 present a computer readable medium containing software instructions. Apart from the utility requirement of 35 U.S.C. 101, usefulness under the patent eligibility standard requires significant functionality to be present to satisfy the useful result aspect of the practical application requirement (See Arrhythmia, 958 F.2d at 1057, 22 USPQ2d at 1036). Merely claiming nonfunctional descriptive material stored in a computer-readable medium does not make the invention eligible for patenting. For example, a claim directed to a word processing file stored on a disk may satisfy the utility requirement of 35 U.S.C. 101 since the information stored may have some "real world" value. However, the mere fact that the claim may satisfy the utility requirement of 35 U.S.C. 101 does not mean that a useful result is achieved under the practical application requirement. The claimed invention as a

whole must produce a "useful, concrete and tangible" result to have a practical application. In the instant case, similar to claims 1 and 41 described above, claims 47 and 48 result in a final step of "comparing said at least one statistical quantity to said control limit in order to determine if the substrate processing remains within control during the course of manufacturing" which is not considered to be a "useful, concrete, and tangible" result.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1-8, 11-16, 19-23, 25-27, 33-35, and 47, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2003/0055523 to Bunkofske et al. in view of U.S. Patent Application Publication No. 2002/0107858 to Lundahl et al. and U.S. Patent Application Publication No. 2005/0055175 to Jahns et al. and further in view of U.S. Patent No. 6,622,059 to Toprac et al.

Bunkofske discloses a method of monitoring a processing system for processing a substrate during the course of semiconductor manufacturing (0002 and 0048), comprising acquiring data from said processing system for a plurality of observations, said data comprising a plurality of data parameters/variables (0049

and 0052); constructing a principal components analysis (PCA) model from said data (0047), including centering and scaling (0056); determining at least one statistical quantity from said data using said PCA model (0043 and 0047); setting a control limit for said at least one statistical quantity (0059); and comparing said at least one statistical quantity to said control limit (0059) in order to determine if the substrate processing remains within control during the course of manufacturing (0086).

Bunkofske discloses detecting a process fault has occurred when said at least one statistical quantity exceeds said control limit (0059).

Bunkofske discloses that constructing said PCA model comprises determining one or more principal components of said data for said plurality of observations using principal components analysis (0012)

Bunkofske discloses that said plurality of data parameters comprises an instantaneous value of at least one of chamber pressure and RF power (0006).

Bunkofske discloses that said statistical quantity comprises at least one of a Q-statistic and a Hotelling T^2 parameter (0043).

Bunkofske further discloses a controller as part of a process performance monitoring system coupled to a process tool, inherently operating in accordance with a program stored on computer readable medium, for carrying out the method as well as coupled to a plurality of sensors attached to the process tool for acquiring the data (0019 and 0049).

As noted above, Bunkofske teaches many of the features of the claimed invention and while Bunkofske does explicitly disclose that the measurement data used for constructing a principle components analysis "is scaled and centered and a correlation matrix is calculated" (0056), the disclosure of Bunkofske does not provide details regarding this process.

Lundahl teaches a method and system for the dynamic analysis of data using principal components analysis (0065) and further teaches the well-known method of performing centering and scaling comprising applying centering coefficients to each of a plurality data parameters by subtracting centering coefficients from each of said data parameters and applying scaling coefficients to each of a plurality of data parameters by dividing each of said data parameters by said scaling coefficients (0059 and 0060).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske to include the scaling and centering method of Lundahl because the combination would have provided the well-known method for carrying out the centering and scaling in a conventional manner as required in the method of Bunkofske (0059 and 0060).

Further, while the invention of Bunkofske and Lundahl does teach many of the features of the claimed invention including applying centering coefficients to each of a plurality of data parameters in a PCA model, wherein the centering coefficients are determined based on the data from the processing system, the combination does not specify that the method acquire additional data from the processing system after

constructing the PCA model to form adjusted data and adjusted centering/scaling coefficients.

Jahns teaches industrial process fault detection using principal component analysis comprising acquiring initial data from a processing system (0009, lines 1-6) for a plurality of observations said initial data comprising a plurality of data parameters (0011, lines 1-4 and 0035, lines 6-21), constructing an initial principal components analysis model from the data parameters (0011, lines 5-14), acquiring additional data from the processing system after construction of the initial PCA model and producing updated data matrices and updated models using both previous run data from the initial data/model and current data obtained as the additional data (0044, lines 10-16 and 0046, lines 6-10).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske and Lundahl to specify that the method acquire additional data from the processing system after constructing the PCA model to form adjusted data and adjusted centering/scaling coefficients (i.e. provide an improved process center and updated processing), as taught by Jahns, because the invention of Bunkofske and Lundahl teaches processing the acquired data from the processing system to form centering and scaling coefficients and Jahns suggests that the combination would have improved the overall analysis of Bunkofske and Lundahl by providing real time updating of the data from the system thereby keeping the process data and scaling/centering coefficients accurate to detect an abnormal

process faster and reduce the number of products exposed to the abnormal process (0009, line 1 to 0010, line 5).

Further, since the invention of Bunkofske and Lundahl teaches determining a statistical quantity for abnormality determination based on a centered and scaled PCA model, and the invention of Jahns teaches modifying the invention of Bunkofske and Lundahl to specify that the PCA model is a PCA model that has been updated and now comprises an initial PCA model and additional data with updated adaptive centering and scaling coefficients, the combination teaches determining a statistical quantity for abnormality determination based on a combination of an initial PCA model and additional data that has been centered and scaled by updated adaptive centering and scaling coefficients.

As noted above, Bunkofske in combination with Lundahl and Jahns teaches many of the features of the claimed invention and while the invention of Bunkofske, Lundahl, and Jahns does teach adjusting the centering coefficients utilizing both previous run data from said initial data and current data obtained from the additional observation, the combination does not specify that the adjustment is done at the time of each observation of the additional data. Additionally, while the invention of Bunkofske, Lundahl, and Jahns does teach generating centering and scaling coefficients which are determined based on updated process data, and therefore also updated, the combination does not specifically provide the method for updating the centering coefficient.

Toprac teaches an automated process monitoring and analysis system for semiconductor processing comprising acquiring data from said processing system for a plurality of observations, said data comprising a plurality of data parameters (column 4, lines 9-23), constructing a principal components analysis (PCA) model from said data (column 10, lines 46-51), acquiring additional data from said processing system, said additional data comprising an additional observation (i.e. current measurement) of said plurality of data parameters, obtaining a mean of the data parameters, and adjusting the mean of the data parameters to form an updated mean at the time of each additional observation (column 18, lines 27-46).

Toprac teaches that adjusting the mean of the data parameters comprises updating the mean of the data parameters for each data parameter by combining an old value of the mean for each data parameter and a current value of each data parameter for said additional observation, wherein said old value comprises a mean value of the data parameter during said plurality of observations (column 18, lines 27-46).

Toprac further teaches that combining said old value of said adaptive mean and said current value of said data parameter for said additional observation comprises applying an exponentially weighted moving average filter (column 18, lines 27-46) as well as setting a weighting factor to any value ranging from 0.0 to 1.0 as appropriate based on an amount of confidence (column 18, lines 47-53).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, Lundahl, and Jahns to specify that the adjustment is done at

the time of each observation of the additional data, as taught by Toprac, because, as suggested by Toprac and recognized by one having ordinary skill in the art, the combination would have improved the response time of the adaptation of Bunkofske, Lundahl, and Jahns by updating the coefficients each time a new observation is obtained, thereby insuring that accurate results are consistently determined and provided (column 18, lines 27-46) and further reducing the number of products exposed to the abnormal process, as desired by Jahns (Jahns; 0009, line 1 to 0010, line 5)

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, Lundahl, and Jahns to specify the method for updating the centering coefficient, as taught by Toprac, because the invention of Bunkofske, Lundahl, and Jahns does teach generating the centering coefficient as a mean of consistently updated process data wherein the process data is obtained by a moving calculation (i.e. erasing the earliest scan and adding the newest) (Jahns, 0059, lines 1-10) and Toprac suggests that the combination would have provided a corresponding method for updating the centering coefficient/mean that would have improved the centering performed by Bunkofske, Lundahl, and Jahns by applying a centering coefficient that is consistently updated and weighted based on confidences corresponding to the data obtained (column 18, lines 47-53).

11. Claim 9, 10, 24, 28, and 36, as may best be understood, is rejected under 35

U.S.C. 103(a) as being unpatentable over Bunkofske et al. in view of Lundahl et al., Jahns et al., and Toprac et al. and further in view of U.S. Patent No. 5,796,606 to Spring.

As noted above, Bunkofske in combination with Lundahl, Jahns, and Toprac teaches many of the features of the claimed invention, and while the invention of Bunkofske, Lundahl, Jahns, and Toprac does teach generating centering and scaling coefficients which are determined based on updated process data, and therefore also updated, the combination does not specifically provide the method for updating the scaling coefficient.

Spring teaches a process information and maintenance system for distributed control systems including means for obtaining data and from the data calculating/filtering a standard deviation using an exact recursive standard deviation employing an old value of the standard deviation, a current value of additional data, an old value of a mean, and a constant (column 6, line 41 to column 7, line 8).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, Lundahl, Jahns, and Toprac to specify the method for updating the scaling coefficient, as taught by Spring, because the invention of Bunkofske, Lundahl, Jahns, and Toprac does teach generating the scaling coefficient as a standard deviation of consistently updated process data wherein the process data is obtained by a recursive calculation (i.e. erasing the earliest scan and adding the newest) (Jahns, 0059, lines 1-10) and Spring suggests that the combination would have provided a corresponding method for updating the scaling

coefficient/standard deviation that would have improved the scaling performed by Bunkofske, Lundahl, Jahns, and Toprac by applying a scaling coefficient that is consistently updated and weighted based on a window that allows discounting of the oldest information using exponential-weighting-into-the-past (column 6, line 41 to column 7, line 8).

Further since the invention of Spring performs recursive standard deviation employing an old value of the standard deviation, a current value of additional data, an old value of a mean, and the invention of Bunkofske, Lundahl, Jahns, and Toprac defines the standard deviation as a scaling coefficient and the mean value as a centering coefficient, the combination performs recursive standard deviation employing an old value of the scaling coefficient, a current value of additional data, an old value of the centering coefficient.

12. Claims 17, 18, 29-32, 37-42, and 48, as may best be understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Bunkofske et al. in view of Lundahl et al., Jahns et al. and Toprac et al., and further in view of U.S. Patent Application Publication No. 2003/0144746 to Hsiung et al.

As noted above, Bunkofske in combination with Lundahl, Jahns, and Toprac teaches many of the features of the claimed invention and while the invention of Bunkofske, Lundahl, Jahns, and Toprac does teach acquiring many types of data, including adaptive scaling coefficients, the combination does not specifically include

obtaining the many types of data via at least one of an intranet and an internet from a second process.

Hsiung teaches control for an industrial process using one or more multidimensional variables comprising a first industrial process connected to a second industrial process and/or server via an internet for accessing data (0036, 0040, and 0045) wherein the data is used in performing principal component analysis (0066 and 0106).

It would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, Lundahl, Jahns, and Toprac to specifically include obtaining the many types of data via at least one of an intranet and an internet from a second process, as taught by Hsiung, because, as suggested by Hsiung, the combination would have improved the overall analysis of the first process by validating the many types of data by comparison with the same data from a similar process (0036).

Response to Arguments

13. Applicant's arguments with respect to claims 1-42, 47, and 48 have been considered but are moot in view of the new grounds of rejection:

The following arguments, however, are noted:

Applicant argues:

> Regarding the statutory rejection, the claims have been amended to define the tangible result achieved in the presently claimed inventions. Hence, it is respectfully, submitted that presently amended Claims 1-24, 41, 42, 47, and 48 define statutory subject matter.

The Examiner asserts that, as set forth in the August 2006 revision of the MPEP, a claimed invention is directed to a practical application of a 35 U.S.C. 101 judicial exception when it: "transforms" an article or physical object to a different state or thing; or otherwise produces a useful, concrete and tangible result.

In the instant case, claims 1, 19, 41, 47, and 48 do not provide a transformation or reduction of an article to a different state or thing, but instead only obtain and process data to form models, with this obtaining and processing of data performing no physical transformation.

In the instant case, claims 1, 19, 41, 47, and 48 also do not provide a useful, concrete and tangible result, but instead, as noted in the Office Action, only provide concluding steps of internal data manipulation that is not externally conveyed, specifically the claimed limitations do not output, store, or produce any tangible form of the data manipulation to accomplish a practical application.

For these reasons, the Examiner maintains that claims 1-24, 41, 42, 47, and 48 are directed to non-statutory subject matter.

Applicant argues:

The outstanding Office Action relies on Lundahl et al for its teaching of centering and scaling model-based control. However, Lundahl et al does not disclose or suggest the scaling procedure defined in the present claims. At most, Lundahl et al disclose at numbered paragraph [0060] that scaling a matrix Y refers to the division of each entry in a given column by the sample standard deviation of that column. This is a procedure performed every time a PCA model is constructed. Such a disclosure does not disclose or suggest the claimed determination of at least one statistical quantity using a combination of the initial

PCA model and the additional data that has been centered by the updated adaptive centering coefficients.

The outstanding Office Action acknowledges on page 6, lines 15-21, that Bunkofske et al do not teach acquiring additional data from the processing system to form an adjusted centering coefficient. Without a teaching in Bunkofske et al for an adjusted centering coefficient, the deficiencies in Lundahl et al are also not overcome by Bunkofske et al.

The Office Action applies Jahns et al for its teaching of industrial process fault detection using principle component analysis (PCA). Jahns et al do disclose normalization procedures in numbered paragraphs [0051] - [0053] that utilize standard deviation calculations. Therein, Jahns et al disclose that normalization is accomplished by dividing each scalar standard deviation value σi for a particular model by an average standard deviation value σaverage for that model. Like Lundahl et al, this is a procedure performed every time a PCA model is constructed. Accordingly, Jahns et al recalculate and reproduce a principal components model and therefore do not determine at least one statistical quantity using a combination of the ***initial*** PCA model and the additional data that has been centered by the updated adaptive centering coefficients. Thus, the deficiencies in Lundahl et al are also not overcome by Jahns et al.

The Examiner asserts that Bunkofske discloses obtaining process data and collapsing the process data to form a PCA model (0047 and 0054-55), centering and scaling the PCA model data (0056) and determining a statistical quantity from the scaled PCA model (0057).

The invention of Bunkofske, and Lundahl, is then modified by the invention of Jahns to specify that the method acquire additional data from the processing system after constructing the PCA model to form adjusted data and adjusted centering/scaling coefficients.

This modification is met by Jahns teaching fault detection using principal component analysis comprising acquiring initial data from a processing system (0009, lines 1-6) for a plurality of observations said initial data comprising a plurality

of data parameters (0011, lines 1-4 and 0035, lines 6-21), constructing an initial principal components analysis model from the data parameters (0011, lines 5-14), acquiring additional data from the processing system after construction of the PCA model and producing updated data matrices and updated models using both previous run data from the initial data/model and current data obtained as the additional data (0044, lines 10-16 and 0046, lines 6-10) to provide real time updating of the data from the system thereby keeping the process data and scaling/centering coefficients accurate to detect an abnormal process faster and reduce the number of products exposed to the abnormal process (0009, line 1 to 0010, line 5).

Therefore, since the invention of Bunkofske teaches constructing a PCA model and centering and scaling the PCA model before determining a statistical quantity for processing for abnormalities and the invention of Jahns teaches updating the "initial" model by obtaining additional data to ensure that the abnormal processing, implemented by the statistical quantity of Bunkofske, is based on the most recently updated data comprising the initial PCA model and the additional data, the combination would have determined the statistical quantity using a combination of the initial PCA model and the additional data in the form of an updated model that has been centered and scaled by the centering and scaling coefficients.

Therefore, the Examiner maintains that the combination of Bunkofske and Jahns meets the argued limitations regarding the statistical quantity determination based on the "initial" PCA model.

The Examiner further notes that it would have been obvious to one having ordinary skill in the art to modify the invention of Bunkofske, and Lundahl, to specify that the method acquire additional data from the processing system after constructing the PCA model to form adjusted data and adjusted centering/scaling coefficients, as taught by Jahns, because the invention of Bunkofske and Lundahl teaches processing the acquired data from the processing system to form centering and scaling coefficients and Jahns suggests that the combination would have improved the overall analysis of Bunkofske and Lundahl by providing real time updating of the data from the system thereby keeping the process data and scaling/centering coefficients accurate to detect an abnormal process faster and reduce the number of products exposed to the abnormal process (0009, line 1 to 0010, line 5).

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to Applicant's disclosure.

U.S. Patent No. 5,949,678 to Wold et al. teaches a method for monitoring multivariate process comprising performing PCA by applying centering and scaling (column 11, lines 60-65) wherein the centering is performed using a EWMA filter and subtracting centering values to update the EWMA (column 12, lines 18-30) and scaling is performed by dividing the data set by a standard deviation wherein the

standard deviation (i.e. scaling coefficient) is updated/adapted based on weighted local data (column 12, lines 31-42)

U.S. Patent No. 6,896,763 to Balasubramhanya et al. teaches a method and apparatus for monitoring a process by employing principal component analysis.

U.S. Patent No. 6,330,526 to Yasuda teaches a characteristic variation evaluation method of a semiconductor device.

U.S. Patent No. 6,675,137 to Toprac et al. teaches a method of data compression using principal components analysis.

U.S. Patent Application Publication No. 2002/0072882 to Kruger et al. teaches multivariate statistical process monitors.

Cherry et al., "Semiconductor Process Monitoring and Fault Detection Using Recursive Multi-Way PCA" teaches a method for quickly and accurately detecting faulty sensors or measurements in a semiconductor processing environment.

Shirazi et al., "A Modular Realization of Adaptive PCA" teaches an adaptive PCA algorithm which alleviates suboptimality of the PCA method for non-stationary signals.

Chatterjee et al., "Algorithms for Accelerated Convergence of Adaptive PCA" teaches an adaptive algorithm for PCA that is shown to converge faster than traditional PCA.

15. Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey R. West whose telephone number is (571)272-2226. The examiner can normally be reached on Monday through Friday, 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (571)272-2216. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jeffrey R. West
Examiner – AU 2857

November 13, 2006